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Growth evalution of *Chlamydomonas oblonga* with bioremediation through co-usage of wastewater and flue gasses of Hasdeo thermal power plant Korba West Chhattisgarh at indoor and outdoor conditions

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Expansion in technological advancements and urbanization, results in huge energy requirement at the same time requirement of alternate biological energy. A cost effective alternative energy production technique can be developed by using Thermal power-plant waste-water as a nutrient source and exhaust gas as an inorganic carbon source for micro-algae growth. The harmful effect of waste-water and exhaust gas of thermal power-plant is well known which can also diminished by coupling technology of remediation and bio-diesel production using micro-algae. *Chlamydomonas oblonga* has grown at indoor and outdoor conditions, which shows that in presence of 100% wastewater at outdoor conditions gives best result and provide specific growth rate of 0.188 d-1, hence this conditions were selected for large scale production of micro-algae. Total large scale culture was done with 60 liters of microalgae culture in glass bottles. Temperature was in the range of (20-36o C) with no aeration. Dry biomass produced is 1.087 g/l. Total dry biomass produced from 60 liter culture is 60.22 gms. Lipid content of *C. oblonga* grown in outdoor condition and wastewater is 29.72%. High growth rate was accomplished by *Chlamydomonas oblonga* in 100% waste-water and 7% carbon-dioxide from flue gas. Co-utilization of exhaust gases and waste-water can prompts to triple advantages, firstly energy production in terms of bio-diesel, secondly air pollution reduction through carbon dioxide sequestration and lastly water pollution reduction as well as waste utilization. As this technology is both environment friendly and economic viable, it can be applied for substantial scale production as integrated bio-diesel production plant combined with thermal power-plant.

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Environmental biotechnology and sustainable development studies on cellulose production by *Bacillus* species

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Cellulose is the most abundant biomass on the earth. It is the structural component of primary cell wall of green plants, many forms of algae and oomycetes. It is possible to transform the insoluble polymer into glucose, an excellent substrate for industrial fermentation by using chemical and physical methods. In the present study, samples of soil and cow dung were collected from different locations of Punjab and Himachal Pradesh for isolation of cellulose degrading bacterial strains. The most efficient cellulose degrading bacteria was found in cow dung sample with maximum zone of inhibition of 10 mm. The selected efficient isolate was characterized by biochemical and microscopic methods and found to be *Bacillus* sp. Different types of substrates like baggase, wheat bran, paddy straw, rice bran and wheat straw were used for maximum degradation of cellulose and cellulase producing ability. Various parameters like pH, temperature, inoculum concentration, incubation time, carbon and nitrogen source was studied for maximum degradation of cellulose and cellulase producing ability. Selected bacterial strain showed maximum growth and cellulase production at 37oC and at pH 7.0 with 2% (v/v) inoculum concentration after 72 hours of incubation by using peptone at concentration of 1% (w/v). The best induction was also exhibited by use of carboxymethyl cellulose (CMC) at 1% (w/v) concentration.

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